FIELD SAMPLING REPORT
PCR MONITORING

Prepared for

Cerro Copper Products Company
Sauget, Illinois

DECEMBER 1989

Sverdrup

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12/11/89
153543

FIELD SAMPLING REPORT

PERIODIC COMPLIANCE REPORT MONITORING

CERRO COPPER PRODUCTS COMPANY
SAUGET PLANT
SAUGET, ILLINOIS

Prepared By

SVERDRUP CORPORATION
ST. LOUIS, MISSOURI

December 1989

FOREWORD

Sverdrup Corporation was retained by Cerro Copper Products Company in December 1987, to conduct Periodic Compliance Report (PCR) monitoring involving various wastewater discharges associated with the Sauget Plant. The field activities related to the work for this reporting period included:

1. Preparation of Sampling Locations/Flow Monitoring Equipment
2. Preparation of Sample Bottles
3. Collection of Wastewater Samples
4. Collection of Flow Rate Data
5. Analysis of Flow Rate Data

Activities 1 and 2 took place on December 13, 1989, Activities 3 and 4 were performed over a 24-hour period beginning the morning of December 14, 1989, and Activity 5 was performed December 15, 1989.

This report presents the field and analytical results related to the PCR monitoring for all locations. Its purpose is to present the data obtained for reasons of documentation and future use by Cerro.

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I DESCRIPTION OF SAMPLING LOCATIONS

This section provides a brief description of each of the sampling locations, including the significance of the discharge, the flow monitoring method, and specific sample collection points.

LOCATION 3B

Sampling Location 3B is at the lift station just north of Tube Mill No. 2 (see Figure I-1). The sampling point was the discharge from a 12-inch diameter cast iron pipe entering the wet well from the east. The flow in the pipe represents the wastewater discharge from the Copper Forming operations at Tube Mill No. 2, with the exception of some sanitary wastewater that enters the wet well via a 6-inch diameter cast iron pipe adjacent and above the sampling point.

The wet well is approximately 15 feet deep with the sampling point approximately 4 feet off the bottom. Flow rate was monitored by means of a 90 degree V-notch weir insert installed in the 12-inch diameter pipe and a portable continuous-recording flow meter. Samples were collected from the flow exiting the weir.

LOCATION 8A

Sampling Location 8A is at the inlet manhole located along the main plant road just west of the Control Center (see Figure I-1). The flow entering the manhole from the west represents the process flow from the wet-processing areas of the Secondary Copper operations located in the central part of the plant complex. Other flow discharging to the manhole includes stormwater flow from several inlets in the sewer system upstream of the manhole and flow associated with the plant laboratory discharging west from the Control Center.

The manhole is approximately 9 feet deep and serves as access to a 15.0-inch Leopold Lagco permanent flume installed inside a 15-inch diameter PVC pipe. Flow rate was monitored by a portable ultrasonic-type flow meter/strip chart recorder associated with the flume. Samples were collected from the flume.

LOCATION 9A

Sampling Location 9A is at the lift station just north the Metal Molding and Casting Facility at Shaft Furnace Building No. 19 (see Figure I-1). The sampling point

was the discharge from a 12-inch diameter cast iron pipe entering the wet well from the west. The flow in the pipe has been greatly reduced and now is only non-regulated process and non-process wastewaters such as non-contact cooling water, drinking fountains, and other miscellaneous non-regulated wastewaters. The flow is increased during winter months for freeze-protection.

The wet well is approximately 12 feet deep with the sampling point approximately 4 feet off the bottom. Flow rate was monitored by means of a 90 degree V-notch weir bolted to the wall in front of the 12-inch pipe and a portable continuous-recording flow meter. Samples were collected from the flow exiting the weir.

LOCATION 12C

Sampling Location 12C is the discharge from the East Outfall Lift Station located at the extreme northeast sector of the plant (see Figure I-1). The flow discharging the lift station represents the majority of the process wastewater, sanitary wastewater, and stormwater leaving the plant site that is associated with the Copper Forming and Secondary Copper operations at the plant. Monitoring at this location allows full quantification of the pollutant discharge rates leaving the plant complex via the East Outfall.

Flow rate was monitored by a continuous-recording flow meter installed to record the discharge from the lift station via the lift station pumps. Samples were collected from an access manhole next to the lift station.

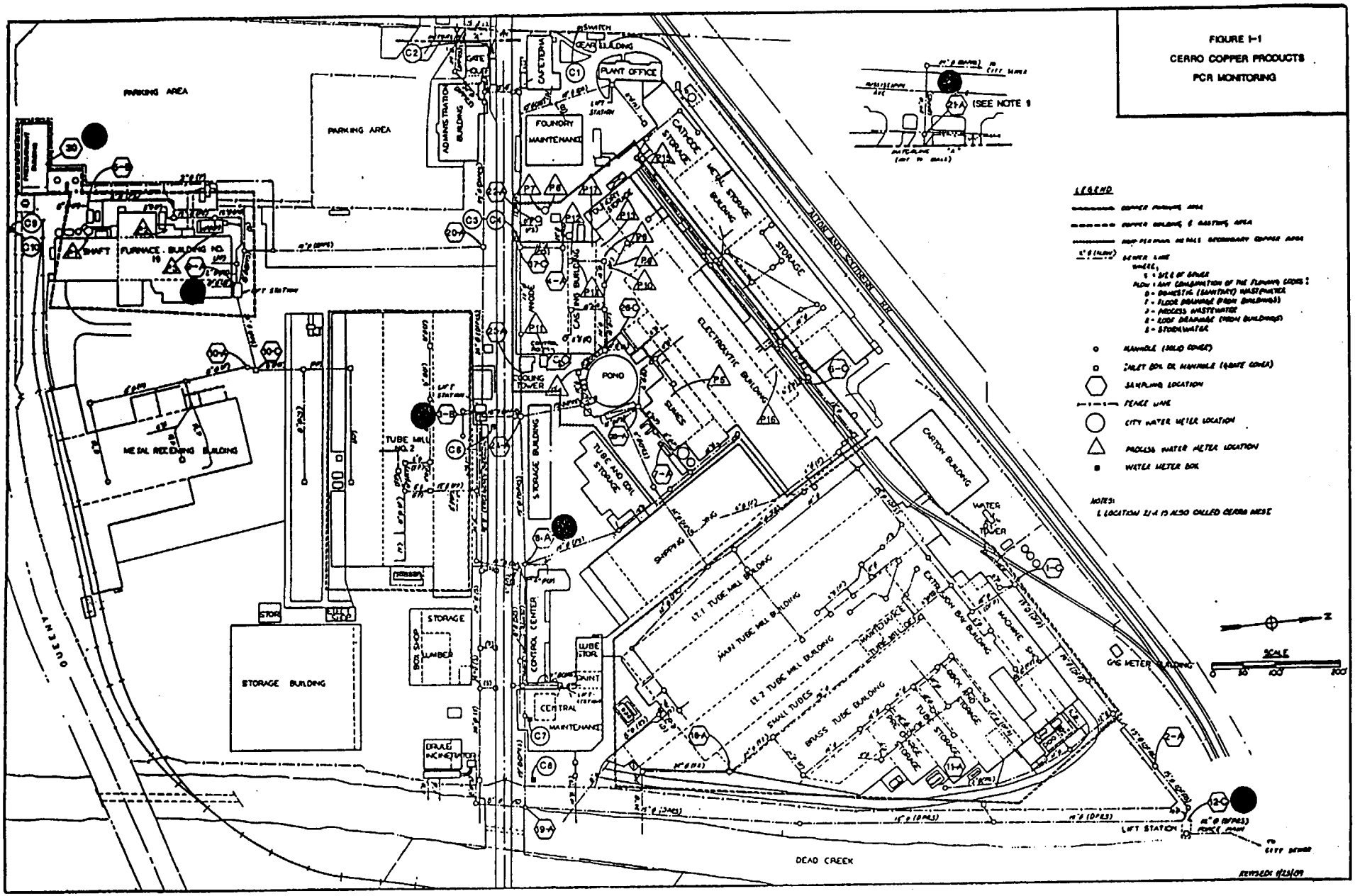
LOCATION 21A (CERRO WEST)

Sampling Location 21A is at the inlet manhole at the west entrance to the plant located east of Mississippi Avenue (see Figure I-1). Monitoring at this location allows full quantification of pollutant discharge rates leaving the plant complex via the West Outfall. It includes all flow discharged from the lift stations at Building 19 and Tube Mill No. 2, stormwater from the main parking area, and sanitary flow contributed from the Administration Building, Cafeteria, and Gate House.

The manhole is approximately 12 feet deep and serves as access to an 18.0-inch Leopold Lagco permanent flume installed in an 18-inch diameter clay pipe. Flow rate was monitored by a permanent sonic-type flow meter/strip chart recorder associated with the flume. Samples were collected from the flume.

SAMPLING LOCATION 30 (COPPER MOLDING & CASTING TREATMENT PLANT)

Sampling Location 30 is the discharge from the Copper Molding and Casting Pretreatment system for the blowdown from the casting furnace air pollution scrubber. Periodic blowdown from the direct chill casting cooling tower system is fed as makeup to the recycle tank in the casting furnace air pollution scrubber system for reuse and ultimate inclusion in the blowdown to the pretreatment system. A single grab sample was collected from the well-mixed treated contents of each of the two effluent storage tanks prior to discharge. The combined discharge from the two tanks is considered a batch.



● MONITORING LOCATION

II SAMPLE COLLECTION/FLOW MONITORING PROCEDURES

SAMPLE COLLECTION

Grab samples were collected at all locations to prepare the sample bottles needed for the required analyses. Some of the individual grab samples were used to compile 24-hour flow-proportional composite samples for semi-volatile organics (NVBN + NVA), and metals analysis. (See Table II-1 for a summary of the type of sample bottles and preservatives used.)

Grab Samples

Grab samples were collected on 2-hour intervals during the 24-hour period for metals and for semi-volatile organics analysis at each sampling location except Location 30. In addition, grab samples also were collected on 6-hour intervals for VOA, total phenols, and oil & grease analysis, and for field pH measurements, at each of the sampling locations. The pH was measured 4 times during the 24-hour sampling period for each sampling location. Grab samples also were collected for all parameters of the discharge from the treatment plant associated with the copper molding and casting operations (Location 30). The grab samples were collected from the flow exiting the weir or flume at each applicable location. All grab samples were placed on ice after collection.

Composite Samples

Twenty-four hour flow-proportional composite samples for metals and semi-volatile organics analysis were prepared by the analytical laboratory for each sampling location. A data sheet that listed the percentage of sample required from each grab sample, based on the flow rates measured during the twelve 2-hour sampling periods, was compiled for each locations. Section IV includes a summary of the data compiled for the preparation of the laboratory composite samples.

FLOW MONITORING

Wastewater flow rate and quantity were monitored at each location except Location 30 during sample collection. This was accomplished by totalizing/recording flow meters at each location. Table II-2 provides a summary of the flow measurement devices for each sampling location.

TABLE II-1
SAMPLE BOTTLES AND PRESERVATIVES

Analysis	Bottle Type	Size	Preservative
VOA(1)	Clear Glass	40 ml	Ice
NVBN + NVA (2)	Clear Glass	16 oz	Ice
Metals(3)	Clear Glass	8 oz	Nitric Acid
Oil & Grease	Clear Glass	16 oz	Sulfuric Acid
Total Phenols	Clear Glass	16 oz	Sulfuric Acid

NOTES:

1. Volatile Organics Analysis - EPA Priority Pollutants.
2. Nonvolatile Base/Neutral Extractable Organics + Nonvolatile Acid Extractable Organics - EPA Priority Pollutants.
3. Analyzed for Total Chromium, Total Copper, Total Lead, Total Nickel, and Total Zinc.

TABLE II-2
FLOW MEASUREMENT DEVICE FOR EACH SAMPLING LOCATION

	Pipe		Device	
Location	Type	Size (in.)	Type	Size (in.)
3B	Cast Iron	12	90 Degree V-Notch weir with continuous flowmeter/recorder	-
8A	Polyvinyl Chloride	15	Rectangular flume with continuous flowmeter/recorder	15.0
9A	Cast Iron	12	90 Degree V-Notch weir with continuous flowmeter/recorder	-
12C	Polyvinyl Chloride	4	Sonic Flowmeter with continuous totalizer/recorder	-
21A	Clay	18	Rectangular Flume with continuous flowmeter/recorder	18.0

III SUMMARY OF FLOW MONITORING AND FIELD pH DATA

Flow data were compiled during the 24-hour sampling period by periodically reading the totalizers associated with each flow meter. The data are presented in Table III-1. The flow rates in the table are calculated average flows based on recorded totalizer readings and the time intervals between readings.

Field pH measurements were made on samples collected 4 times during the 24-hour sampling period. The data are compiled in Table III-2.

TABLE III-1

PCR MONITORING
FLOW RATE MEASUREMENT SUMMARY

Reading	Date**	3B Time*	3B Flow#	8A Time	8A Flow	9A Time	9A Flow	12C Time	12C Flow	21A Time	21A Flow
1	12/14	0825	16.1	0906	62.6	(1)		0930	99.5	0840	22.2
2	12/14	1035	12.8	1113	61.3			1130	90.8	1055	27.3
3	12/14	1235	13.8	1254	54.8			1259	90.5	1245	50.0
4	12/14	1435	23.8	1457	36.3			1507	72.8	1445	56.9
5	12/14	1638	13.6	1701	28.9			1721	69.4	1648	29.2
6	12/14	1850	11.3	1908	36.5			1935	70.3	1905	22.5
7	12/14	2024	12.8	2043	29.7			2055	71.0	2034	36.7
8	12/14	2214	14.1	2238	22.7			2240	58.6	2223	40.0
9	12/15	0023	13.7	0037	56.8			0042	57.5	0028	34.5
10	12/15	0248	25.2	0308	43.3			0317	56.4	0253	58.8
11	12/15	0422	16.5	0440	43.3			0458	57.3	0435	50.0
12	12/15	0610	17.9	0622	43.3			0558	86.9	0615	19.4
13	12/15	0845	-	0858	-			0905	-	0850	-
Minimum			11.3		22.7				56.4		19.4
Maximum			25.2		62.6				86.9		58.8
Average			16.0		43.3				73.4		37.3

* Time is based on 24-hour clock, reflects time sample was collected.
\# Flow is in Gallons/Minute (GPM).
\+ Flows are calculated averages based on recorded totalizer readings and the time interval between readings.
** Date reflects starting time of each set of readings at Location 3B.
(1) Samples were not collected at Location 9A due to operational problems caused by extremely cold weather.

TABLE III-2

PCR MONITORING
pH MEASUREMENT SUMMARY ##

Reading#	Date**	3B Time*	3B pH	8A Time	8A pH	9A Time	9A pH	12C Time	12C pH	21A Time	21A pH
3	12/14	1235	8.2	1254	9.1	(1)		1259	9.0	1245	8.3
6	12/14	1850	8.4	1908	9.0			1935	9.2	1905	8.4
9	12/15	0023	8.5	0037	8.9			0042	8.8	0028	8.4
12	12/15	0610	8.4	0622	8.9			0558	8.5	0615	8.3
Minimum			8.2		8.9				8.5		8.3
Maximum			8.5		9.1				9.2		8.4

Readings correspond to readings for flow rate in Table III-1.

Measurements were made in the Cerro Quality Control Laboratory in accordance with the procedures defined in Standard Methods. The holding times before measurements were made ranged between 6 and 69 minutes, with the average holding time being 34.4 minutes.

* Time is based on 24-hour clock, reflects time each sample was collected.

** Date reflects starting time of each set of readings at Location 3B.

(1) Samples were not collected at Location 9A due to operational problems caused by extremely cold weather and severe wind chill conditions.

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 3 — SAMPLING DATE: 12-14-87

SAMPLE CARRIER: Dwane McDowell (sign) — DATE: 12-15-89 TIME: 2:30 (Pm)

LABORATORY: Industrial Testing Lab — PHONE: 314/771-7111
ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 — CONTACT: Robert Winkler Dwayne McDowell

SAMPLE REC'D BY: Dwane McDowell (sign) — DATE: 12/15/89 TIME: 2:30 (Pm)

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: M. Murphy (sign) — DATE: 12/19/89 TIME: 3pm

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE
1	8.4	12/14	0925	
2	6.7	"	1035	✓
3	7.2	"	1235	
4	12.4	"	1435	
5	7.1	"	1638	✓
6	5.9	"	1850	
7	6.7	"	2024	
8	7.4	"	2214	✓
9	7.2	12/15	0023	
10	13.2	12/15	0248	
11	8.6	12/15	0422	✓
12	9.3	12/15	0610	

PARAMETER	ANALYSIS DATE	TIME	ANALYST
Chromium	12/27/89	11:18	~~M.M~~
Copper	12/27/89	11:18	~~M.M~~
Lead	12/27/89	11:18	~~M.M~~
Mercury	—	—	—
Nickel	12/27/89	11:18	~~M.M~~
Zinc	12/27/89	11:18	~~M.M~~
Base/Neutr.*	1/3/90	12:20	m.m
Acid Extr.*	1/3/90	12:20	m.m
~~Cadmium~~ Cyanide	—	—	—
Phenol+	12/21/89	9:45	KHB
Oil & Grease+	12/19/89	17:00	M.P.
VOC*+	12/20/89	12:33	m.m

Comments: * Standard EPA Toxics

+) Analysis to be performed on 4-Grab Samples

b: Return completed Chain-of-Custody with lab report.

Analysis Requested by: Marjorie Melton

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 8 — SAMPLING DATE: 12-14-89

SAMPLE CARRIER: Duane McDowell (sign) — DATE: 12-15-89 TIME: 2:30 (Pm)

LABORATORY: Industrial Testing Lab — PHONE: 314/771-7111
ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 — CONTACT: Robert Winkler Dwayne McDowell

SAMPLE REC'D BY: Duane McDowell (sign) — DATE: 12/15/89 TIME: 2:30 (Pm)

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: Joe Muggy (sign) — DATE: 12/19/89 TIME: 3:15 pm

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE
37	12.1	12/14	0906	
38	11.8	"	1113	✓
39	10.6	"	1254	
40	7.0	"	1457	
41	5.6	"	1701	✓
42	7.0	"	1908	
43	5.7	"	2043	
44	4.4	"	2238	✓
45	10.9	12/15	0037	
46	8.3	"	0308	
47	8.3	"	0440	✓
48	8.3	"	0622	

ANALYSIS PARAMETER	DATE	TIME	ANALYST
Chromium	12/27/89	11:18	[illegible]
Copper	12/27/89	11:18	[illegible]
Lead	12/27/89	11:18	[illegible]
Mercury	—	—	—
Nickel	12/27/89	11:18	[illegible]
Zinc	12/27/89	11:18	[illegible]
Base/Neutr.*	1/3/90	13:41	M.M
Acid Extr.*	1/3/90	13:41	M.M
Cadmium	—	—	—
Phenol+	12/27/89	17:00	KHB
Oil & Grease+	12/20/89	17:00	M.P.
VOC*+	12/19/89	14:29	M.M

Comments: * Standard EPA Toxics

+) Analysis to be performed on 4-Grab Samples

): Return completed Chain-of-Custody with lab report.

Analysis Requested by: Marjorie Melton

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 12 — SAMPLING DATE: 12-14-89

SAMPLE CARRIER: T M Duane T M Dowell (sign) — DATE: 12-15-89 TIME: 2:30 (Pm)

LABORATORY: Industrial Testing Lab — PHONE: 314/771-7111
ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 — CONTACT: ~~Robert Winkler~~ Duwayne McDowell

SAMPLE REC'D BY: T M Duane T M Dowell (sign) — DATE: 12-15-89 TIME: 2:30 (Pm)

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: M. Muzzy (sign) — DATE: 12-19-89 TIME: 3:30 pm

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE
49	11.8	12/14	0930	
50	6.4	"	1130	✓
51	10.7	"	1259	
52	9.1	"	1507	
53	8.2	"	1721	✓
54	5.0	"	1935	
55	11.0	"	2055	
56	8.1	"	2240	✓
57	8.7	12/15	0042	
58	3.9	"	0317	
59	6.8	"	0458	✓
60	10.3	"	0558	

PARAMETER	ANALYSIS DATE	TIME	ANALYST
Chromium	12/27/89	11:18	T M Dm/s
Copper	12/27/89	11:18	T M Dm/s
Lead	12/27/89	11:18	T M Dm/s
Mercury	1/5/90	15:00	SEE
Nickel	12/27/89	11:18	T M Dm/s
Zinc	12/27/89	11:18	T M Dm/s
Base/Neutr.*	1/3/90	20:34	M.M
Acid Extr.*	1/2/90	20:34	M.M.
~~Cadmium~~ Cyanide	12/18/89	1:10P	KHB
Phenol+	12/27/89	17:00	KHB
Oil & Grease+	12/20/89	17:00	M.F.
VOC*+	12/19/89	17:52	M.M

Comments: * Standard EPA Toxics

(+) Analysis to be performed on 4-Grab Samples

Lab: Return completed Chain-of-Custody with lab report.

Analysis Requested by: Marjorie Meeter

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 21 SAMPLING DATE: 12-14-89

SAMPLE CARRIER: Duane McDowell (sign) DATE: 12-15-89 TIME: 2:30 (pm)

LABORATORY: Industrial Testing Lab PHONE: 314/771-7111
ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 CONTACT: ~~Robert Winkler~~ Duane McDowell

SAMPLE REC'D BY: Duane McDowell (sign) DATE: 12/15/89 TIME: 2:30 (Pm)

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: M. Murray (sign) DATE: 12-19-89 TIME: 345 pm

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE
25	5.0	12/14	0840	
26	6.1	12/14	1055	~
27	11.2	"	1245	
28	12.7	"	1444	
29	6.5	"	1648	~
30	5.0	"	1905	
31	8.2	"	2034	
32	8.9	"	2223	~
33	7.7	12/15	0028	
34	13.1	"	0258	
35	11.2	"	0435	~
36	4.3	"	0615	

PARAMETER	ANALYSIS DATE	TIME	ANALYST
~Chromium	12/27/89	11:18	~~MM~~
~Copper	12/27/89	11:18	~~MM~~
~Lead	12/27/89	11:18	~~MM~~
~Mercury	1/5/90	15:00	SKF
~Nickel	12/27/89	11:18	~~MM~~
~Zinc	12/27/89	11:18	~~MM~~
~Base/Neutr.*	1/3/90	14:34	m.m
~Acid Extr.*	1/3/90	14:34	m.m
~Cyanide ~~Cadmium~~	12/18/89	13:09	RHB
~Phenol+	12/27/89	17:00	RHB
~Oil & Grease+	12/20/89	17:00	M.T.
~VOC*+	12/10/89	14:56	m.m

Comments: * Standard EPA Toxics

(+) Analysis to be performed on 4-Grab Samples

Lab: Return completed Chain-of-Custody with lab report.

Analysis Requested by: Margaret Melton

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 30 - Bldg 19 WWTF Grab — SAMPLING DATE: 11/22/89

SAMPLE CARRIER: [signature] (sign) — DATE: 11/22/89 TIME: ~~13:25~~ 13:25

LABORATORY: Industrial Testing Lab — PHONE: 314/771-7111

ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 — CONTACT: ~~Robert Winkler~~ Duane McDowell

SAMPLE REC'D BY: [signature] (sign) — DATE: 11/27/89 TIME: 13:55

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: N.A. (sign) — DATE: _____ TIME: _____

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE	PARAMETER	ANALYSIS DATE	ANALYSIS TIME	ANALYST
201	N.A.	11/22/89	13:25	N.A.	✓ Chromium			
					✓ Copper			
					✓ Lead			
					~~Mercury~~			
					✓ Nickel			
					✓ Zinc			
					✓ Base/Neutr.*			
					✓ Acid Extr.*			
					~~Cyanide+~~			
					✓ Phenols			
					✓ Oil & Grease			
					✓ VOC*			

Comments: *See attached for parameters to analysis.

~~(+) Analysis to be performed on 4-Grab Samples~~

Lab: Return completed Chain-of-Custody with lab report.

Analysis Requested by: _____

CHAIN OF CUSTODY - WASTEWATER SAMPLES
CERRO COPPER PRODUCTS- SAUGET, ILLINOIS

SAMPLING LOCATION: 30 - Bldg 19 WWTF Grab — SAMPLING DATE: 11/27/89

SAMPLE CARRIER: [signature] (sign) — DATE: 11/27/89 TIME: 10:15

LABORATORY: Industrial Testing Lab — PHONE: 314/771-7111

ADDRESS: 2350 Seventh Blvd.
St. Louis, Missouri 63104 — CONTACT: ~~Robert Winkler~~ Duane McDowell

SAMPLE REC'D BY: [signature] (sign) — DATE: 11/27/89 TIME: 13:55

COMPOSITING SAMPLES

SAMPLE COMPOSITOR: N.A. (sign) — DATE: _____ TIME: _____

BOTTLE #	RATIO %	SAMPLE DATE	SAMPLE TIME	4-GRAB SAMPLE	PARAMETER	ANALYSIS DATE	ANALYSIS TIME	ANALYST
200	N.A.	11/27/89	10:15	N.A.	✓ Chromium			
					✓ Copper			
					✓ Lead			
					~~Mercury~~			
					✓ Nickel			
					✓ Zinc			
					✓ Base/Neutr.*			
					✓ Acid Extr.*			
					~~Cyanide+~~			
					✓ Phenol*			
					✓ Oil & Grease*			
					✓ VOC*			

Comments: *See attached for parameters to analysis.

~~(+) Analysis to be performed on 4 Grab Samples~~

Lab: Return completed Chain-of-Custody with lab report.

Analysis Requested by: _____

INDUSTRIAL TESTING LABORATORIES inc.

Chemists
Engineers
Metallurgists

2350 Seventh Blvd. • St. Louis, Missouri 63104 | 314/771-7111

Report No. 89-12-10031 January 9, 1990

Project: December 1989 Cerro Copper PCR Monitoring

Sverdrup Corporation
801 North Eleventh Street
St. Louis, MO. 63101 Attn: Mr. Larry Oliver

On December 14, 1989, the Cerro Copper PCR Monitoring samples for December 1989 were picked-up by Mr. Duane McDowell of Industrial Testing Laboratories, Inc., Ms Marjorie Melton, Sverdrup Corporation, relinquished custody of these samples. The samples were composited on December 19, 1989 by Mr. Michael A. Muzzey, Chemist. Mr. Joe Burroughs, Cerro Copper, submitted two (2) samples from Location 30 identified Sample #100 and #200. All sample preservation and storage, upon submittal to the laboratory, were performed in accordance with 40 CFR Part 136 requirements.

II. Analytical Methodologies:

A. EPA 600/4-82-022, March 1982.

All methodologies employed in the analysis of Metals, Oil & Grease and Total Phenols were taken from EPA 600/4-79-020, dated March 1979, as shown below.

Parameter	Method No.
Chromium	200.7
Copper	200.7
Nickel	200.7
Zinc	200.7
Lead	200.7/239.2
Oil & Grease	413.1
Total Phenols	420.1

II. Analytical Methodologies: (con't.)

B. 40 CFR Part 136

All methodologies employed in the analysis of Volatile Organics, Base/Neutral Extractable Organics and Acid Extractable Organics were taken from EPA protocols, as shown below:

Parameter	Method No.
Volatile Organics	624
Base/Neutral Extractable Organics	625
Acid Extractable Organics	625

Respectfully submitted,

Allan M. Siegel

Allan M. Siegel, P.E.
Director

INDUSTRIAL
TESTING
LABORATORIES
inc.

ANALYTICAL REPORT

Report No. 89-12-10031 | Date: January 9, 1990

Client: Sverdrup Corporation | Contact: Mr. Larry Oliver

Project: Cerro Copper PCR Monitoring | Activity: December 1989 PCR

PART A - GRAB SAMPLES

Location 3

Sample ID:	Cerro 2	Cerro 5	Cerro 8	Cerro 11
Matrix:	Water	Water	Water	Water
Sample Date:	12/14/89	12/14/89	12/14/89	12/14/89
Sample Time:	1035	1638	2214	0422

1. Phenols/Oil & Grease

Total Phenols, mg/l	<0.01	0.02	<0.01	<0.01
Oil & Grease, mg/l	26	29	33	26

2. Volatile Organics Analysis (VOA), ug/l

Sample ID:	Cerro 2	Cerro 5	Cerro 8	Cerro 11
Analysis Date:	12/18/89	12/18/89	12/18/89	12/18/89
Method:	624	624	624	624
Acrolein	<100	<100	<100	<100
Acrylonitrile	<50	<50	<50	<50
Benzene	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
Carbon Tetrachloride	<5	6	<5	<5
Chlorobenzene	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloroform	9	9	9	9
Chloromethane	<10	<10	<10	<10
Dibromochloromethane	<5	<5	<5	<5
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
1,1-Dichloroethane	19	15	16	9
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethylene	<5	<5	<5	<5
trans-1,2-Dichloroethylene	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropylene	<5	<5	<5	<5
trans-1,3-Dichloropropylene	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5
Methylene Chloride	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5
Tetrachloroethylene	<5	<5	<5	<5
Toluene	<5	<5	<5	<5
1,1,1-Trichloroethane	480	370	380	160
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethylene	7	7	5	<5
Vinyl Chloride	<10	<10	<10	<10
Xylene(s), total	<10	<10	<10	<10

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Location 21

Sample ID:	Cerro 26	Cerro 29	Cerro 32	Cerro 35
Matrix:	Water	Water	Water	Water
Sample Date:	12/14/89	12/14/89	12/14/89	12/14/89
Sample Time:	1055	1648	2223	0435

1. Phenols/Oil & Grease

Total Phenols, mg/l	0.05	0.05	<0.01	<0.01
Oil & Grease, mg/l	<5	7	21	<5

2. Volatile Organics Analysis (VOA), µg/l

Sample ID:	Cerro 26	Cerro 29	Cerro 32	Cerro 35
Analysis Date:	12/18/89	12/18/89	12/18/89	12/18/89
Method:	624	624	624	624
Acrolein	<100	<100	<100	<100
Acrylonitrile	<50	<50	<50	<50
Benzene	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
Carbon Tetrachloride	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloroform	12	11	9	11
Chloromethane	<10	<10	<10	<10
Dibromochloromethane	<5	<5	<5	<5
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
1,1-Dichloroethane	11	5	<5	7
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethylene	<5	<5	<5	<5
trans-1,2-Dichloroethylene	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropylene	<5	<5	<5	<5
trans-1,3-Dichloropropylene	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	26
Methylene Chloride	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5
Tetrachloroethylene	<5	<5	<5	<5
Toluene	<5	<5	<5	12
1,1,1-Trichloroethane	160	150	49	170
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethylene	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10
Xylene(s), total	<10	<10	<10	130

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Location 8

Sample ID:	Cerro 38	Cerro 41	Cerro 44	Cerro 47
Matrix:	Water	Water	Water	Water
Sample Date:	12/14/89	12/14/89	12/14/89	12/15/89
Sample Time:	1113	1701	2238	0440

1. Phenols/Oil & Grease

Total Phenols, mg/l	<0.01	0.04	<0.01	<0.01
Oil & Grease, mg/l	20	23	39	36

2. Volatile Organics Analysis (VOA), ug/l

Sample ID:	Cerro 38	Cerro 41	Cerro 44	Cerro 47
Analysis Date:	12/19/89	12/19/89	12/19/89	12/19/89
Method:	624	624	624	624
Acrolein	<100	<100	<100	<100
Acrylonitrile	<50	<50	<50	<50
Benzene	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
Carbon Tetrachloride	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloroform	7	5	6	<5
Chloromethane	<10	<10	<10	<10
Dibromochloromethane	<5	<5	<5	<5
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethylene	<5	<5	<5	<5
trans-1,2-Dichloroethylene	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropylene	<5	<5	<5	<5
trans-1,3-Dichloropropylene	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5
Methylene Chloride	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5
Tetrachloroethylene	<5	<5	<5	<5
Toluene	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethylene	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10
Xylene(s), total	<10	<10	<10	<10

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Location 12

Sample ID:	Cerro 50	Cerro 53	Cerro 56	Cerro 59
Matrix:	Water	Water	Water	Water
Sample Date:	12/14/89	12/14/89	12/14/89	12/15/89
Sample Time:	1130	1721	2240	0458

1. Phenols/Oil & Grease

Total Phenols, mg/l	0.03	0.05	<0.01	<0.01
Oil & Grease, mg/l	87	169	30	67

2. Volatile Organics Analysis (VOA), ug/l

Sample ID:	Cerro 50	Cerro 53	Cerro 56	Cerro 59
Analysis Date:	12/19/89	12/19/89	12/19/89	12/19/89
Method:	624	624	624	624
Acrolein	<100	<100	<100	<100
Acrylonitrile	<50	<50	<50	<50
Benzene	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
Carbon Tetrachloride	83	170	39	27
Chlorobenzene	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethylvinyl ether	<10	<10	<10	<10
Chloroform	13	10	10	9
Chloromethane	<10	<10	<10	<10
Dibromochloromethane	<5	<5	<5	<5
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethylene	<5	<5	<5	<5
trans-1,2-Dichloroethylene	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropylene	<5	<5	<5	<5
trans-1,3-Dichloropropylene	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5
Methylene Chloride	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5
Tetrachloroethylene	<5	<5	<5	<5
Toluene	<5	<5	<5	<5
1,1,1-Trichloroethane	500	530	500	360
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethylene	160	170	170	130
Vinyl Chloride	<10	<10	<10	<10
Xylene(s), total	<10	<10	<10	<10

Location 30

Sample ID:	Cerro 100	Cerro 200
Matrix:	Water	Water
Sample Date:	12/15/89	12/15/89
Sample Time:	----	----

1. Phenols/Oil & Grease

Total Phenols, mg/l	0.06	<0.01
Oil & Grease, mg/l	<5	10

2. Volatile Organics Analysis (VOA), ug/l

Sample ID:	Cerro 100	Cerro 200
Analysis Date:	12/20/89	12/20/89
Method:	624	624
Acrolein	<100	<100
Acrylonitrile	<50	<50
Benzene	<5	<5
Bromodichloromethane	<5	<5
Bromoform	<5	<5
Bromomethane	<10	<10
Carbon Tetrachloride	<5	<5
Chlorobenzene	<5	<5
Chloroethane	<10	<10
2-Chloroethylvinyl ether	<10	<10
Chloroform	<5	<5
Chloromethane	<10	<10
Dibromochloromethane	<5	<5
1,2-Dichlorobenzene	<5	<5
1,3-Dichlorobenzene	<5	<5
1,4-Dichlorobenzene	<5	<5
1,1-Dichloroethane	<5	<5
1,2-Dichloroethane	<5	<5
1,1-Dichloroethylene	<5	<5
trans-1,2-Dichloroethylene	<5	<5
1,2-Dichloropropane	<5	<5
cis-1,3-Dichloropropylene	<5	<5
trans-1,3-Dichloropropylene	<5	<5
Ethylbenzene	<5	<5
Methylene Chloride	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5
Tetrachloroethylene	<5	<5
Toluene	<5	<5
1,1,1-Trichloroethane	<5	<5
1,1,2-Trichloroethane	<5	<5
Trichloroethylene	<5	<5
Vinyl Chloride	<10	<10
Xylene(s), total	<10	<10

INDUSTRIAL TESTING LABORATORIES inc.

ANALYTICAL REPORT

Report No. 89-12-10031 | Date: January 9, 1990

Client: Sverdrup Corporation | Contact: Mr. Larry J. Oliver

Project: Cerro Copper PCR Monitoring | Activity: December 1989 PCR

PART B - COMPOSITE SAMPLES

Sample ID:	Location 3	Location 8	Location 12	Location 21
Matrix:	Water	Water	Water	Water
Sample Date:				

1. Metals, mg/l

Analysis Date:	12/26/89	12/26/89	12/26/89	12/26/89
Analysis Method:	200.7/239.2	200.7	200.7	200.7
Chromium	0.12	0.09	0.10	0.10
Copper	0.91	7.42	1.99	4.29
Lead	0.087	2.74	0.38	0.29
Nickel	<0.05	2.03	0.52	<0.05
Zinc	0.13	2.78	0.83	1.33

NOTE: Sampling data available on chain of custody forms.

2. Base/Neutral Extractable Organics Analysis (BNOA), ug/l

Sample ID:	Cerro 3	Cerro 8	Cerro 12	Cerro 21
Analysis Date:	1/3/90	1/3/90	1/3/90	1/3/90
Analysis Method:	625	625	625	625
Acenaphthene	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10
Benzidine	<25	<25	<25	<25
Benzo(a)anthracene	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10
Benzo(ghi)perylene	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10
bis(2-Chloroethoxy) methane	<10	<10	<10	<10
bis(2-Chloroethyl)ether	<10	<10	<10	<10
bis(2-Chloroisopropyl) ether	<10	<10	<10	<10
bis(2-Ethylhexyl) phthalate	<10	<10	<10	<10
4-Bromophenyl phenyl ether	<10	<10	<10	<10
Butylbenzyl phthalate	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10
4-Chlorophenyl phenyl ether	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<10	<10	<10

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Sample ID:	Cerro 3	Cerro 8	Cerro 12	Cerro 21
Diethyl phthalate	<10	<10	<10	<10
Dimethyl phthalate	<10	<10	<10	<10
Di-n-butyl phthalate	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10
Di-n-octyl phthalate	<10	<10	<10	<10
1,2-Diphenylhydrazine	<25	<25	<25	<25
Fluoranthene	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10
Hexachlorocyclo pentadiene	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10
N-Nitrosodimethylamine	<25	<25	<25	<25
N-Nitrosodi-n-propyl amine	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10

3. Acid Extractable Organics Analysis (AOA), ug/l

Sample ID:	Cerro 3	Cerro 8	Cerro 12	Cerro 21
Analysis Date:	1/3/90	1/3/90	1/2/90	1/3/90
Analysis Method:	625	625	625	625
2-Chlorophenol	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10
2-Methyl-4,6-dinitrophenol	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10
4-Nitrophenol	<50	<50	<50	<50
4-Chloro-3-methylphenol	<20	<20	<20	<20
Pentachlorophenol	<50	<50	<50	<50
Phenol	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10

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Sample ID:	Location 30, #100	Location 30, #200
Matrix:	Water	Water

1. Metals, mg/l

Analysis Date:	12/26/89	12/26/89
Analysis Method:	200.7	200.7
Chromium	0.10	0.09
Copper	0.54	0.60
Lead	0.48	0.50
Nickel	<0.05	<0.05
Zinc	0.17	0.22

NOTE: Sampling data available on chain of custody forms.

2. Base/Neutral Extractable Organics Analysis (BNOA), ug/l

Sample ID:	Cerro 100	Cerro 200
Analysis Date:	1/2/90	1/2/90
Analysis Method:	625	625
Acenaphthene	<10	<10
Acenaphthylene	<10	<10
Anthracene	<10	<10
Benzidine	<25	<25
Benzo(a)anthracene	<10	<10
Benzo(a)pyrene	<10	<10
Benzo(b)fluoranthene	<10	<10
Benzo(ghi)perylene	<10	<10
Benzo(k)fluoranthene	<10	<10
bis(2-Chloroethoxy) methane	<10	<10
bis(2-Chloroethyl)ether	<10	<10
bis(2-Chloroisopropyl) ether	<10	<10
bis(2-Ethylhexyl) phthalate	<10	<10
4-Bromophenyl phenyl ether	<10	<10
Butylbenzyl phthalate	<10	<10
2-Chloronaphthalene	<10	<10
4-Chlorophenyl phenyl ether	<10	<10
Chrysene	<10	<10
Dibenzo(a,h)anthracene	<10	<10
1,2-Dichlorobenzene	<10	<10
1,3-Dichlorobenzene	<10	<10
1,4-Dichlorobenzene	<10	<10
3,3'-Dichlorobenzidine	<10	<10

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Sample ID:	Cerro 100	Cerro 200
Diethyl phthalate	<10	<10
Dimethyl phthalate	<10	<10
Di-n-butyl phthalate	<10	<10
2,4-Dinitrotoluene	<10	<10
2,6-Dinitrotoluene	<10	<10
Di-n-octyl phthalate	<10	<10
1,2-Diphenylhydrazine	<25	<25
Fluoranthene	<10	<10
Fluorene	<10	<10
Hexachlorobenzene	<10	<10
Hexachlorobutadiene	<10	<10
Hexachlorocyclo pentadiene	<10	<10
Hexachloroethane	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10
Isophorone	<10	<10
Naphthalene	<10	<10
Nitrobenzene	<10	<10
N-Nitrosodimethylamine	<25	<25
N-Nitrosodi-n-propyl amine	<10	<10
N-Nitrosodiphenylamine	<10	<10
Phenanthrene	<10	<10
Pyrene	<10	<10
1,2,4-Trichlorobenzene	<10	<10

3. Acid Extractable Organics Analysis (AOA), ug/l

Sample ID:	Cerro 100	Cerro 200
Analysis Date:	1/2/90	1/2/90
Analysis Method:	625	625
2-Chlorophenol	<10	<10
2,4-Dichlorophenol	<10	<10
2,4-Dimethylphenol	<10	<10
2-Methyl-4,6-dinitrophenol	<50	<50
2,4-Dinitrophenol	<50	<50
2-Nitrophenol	<10	<10
4-Nitrophenol	<50	<50
4-Chloro-3-methylphenol	<20	<20
Pentachlorophenol	<50	<50
Phenol	<10	<10
2,4,6-Trichlorophenol	<10	<10